National Transportation Safety Board
Aviation Accident Final Report

Location:	NEWBERRY SPRING, CA	**Accident Number:**	LAX00FA300
Date & Time:	08/14/2000, 1255 PDT	**Registration:**	N878R
Aircraft:	Beech K35	**Aircraft Damage:**	Destroyed
Defining Event:		**Injuries:**	1 Fatal, 1 Serious, 1 Minor
Flight Conducted Under:	Part 91: General Aviation - Personal		

Analysis

At 1247, during cruise flight, the pilot advised the radar controller that he had a little oil leak on his windshield. The severity of the leak increased, and 5 minutes later oil had covered the front windshield thus precluding visibility. One minute later, the pilot announced that he had "totally lost oil pressure." Prior to the engine seizing, the pilot attempted to make a forced landing on an interstate freeway. During flare, the airplane impacted three automobiles, cartwheeled, and came to rest upside down. Three days before the accident, the pilot had flown his airplane from Torrance, California, to Bullhead City, Arizona. En route, an engine oil leak became evident, which inhibited the pilot's ability to see through the front windshield. The pilot believed that engine oil was leaking past the engine's crankcase nose seal, aft of the propeller, and that replacing the seal would resolve the leakage problem. (Seepage had been documented in this crankshaft area during the last annual inspection that was completed 21 engine operational hours earlier.) The pilot flew 16 miles to near Needles, California, where repair services were available. Upon arrival, oil was dripping off the engine, and the pilot was advised by an engine shop to have the engine removed and repaired. The pilot declined indicating that he had insufficient funds. Instead, the pilot purchased the nose seal parts from the engine shop, and he hired a local independent mechanic to install them in his airplane. Upon completion of the maintenance, the mechanic requested that the pilot perform a ground run-up to check for leaks. The pilot declined and took off. The accident occurred about 40 minutes later, 92 miles from Needles. In 1986, about 537 engine operational hours earlier, the airplane's landing gear collapsed and the propeller was damaged. The crankcase was found cracked on its front, right side, and the engine was overhauled. The case was repaired, according to the maintenance records. During the last annual inspection, oil seepage was noted on the front, right side of the case. During the accident investigation, a weld was noted on the front, right side of the case, and electrical arc marks were noted about 2.3 inches inside the crankshaft bore. The crankshaft was found to have fractured, and the fracture had originated at the site of the arc marks creating a stress riser in the crankshaft. As the fracture progressed, it provided an avenue for oil to escape from the crankshaft and propagate through the nose seal.

Probable Cause and Findings

The National Transportation Safety Board determines the probable cause(s) of this accident to be: The crankshaft's fatigue failure at the site of an electrical arc mark stress riser, during cruise flight. Contributing factors were the pilot's inadequate preflight inspection, improper decision, and maintenance.

Findings

Occurrence #1: AIRFRAME/COMPONENT/SYSTEM FAILURE/MALFUNCTION
Phase of Operation: CRUISE - NORMAL

Findings
1. (F) MAINTENANCE - IMPROPER - OWNER/PILOT MECHANIC
2. (F) AIRCRAFT PREFLIGHT - INADEQUATE - PILOT IN COMMAND
3. (F) IMPROPER DECISION - PILOT IN COMMAND
4. ENGINE ASSEMBLY,CRANKSHAFT - FATIGUE
5. (C) ENGINE ASSEMBLY,CRANKSHAFT - FAILURE,TOTAL

Occurrence #2: FORCED LANDING
Phase of Operation: DESCENT - EMERGENCY

Findings
6. EMERGENCY PROCEDURE - INITIATED - PILOT IN COMMAND

Occurrence #3: IN FLIGHT COLLISION WITH OBJECT
Phase of Operation: LANDING - FLARE/TOUCHDOWN

Findings
7. OBJECT - VEHICLE

Factual Information

HISTORY OF FLIGHT

On August 14, 2000, about 1255 hours Pacific daylight time, a Beech K35, N878R, experienced an in-flight emergency during cruise flight. The pilot made a forced landing on a highway, about 11 miles east of Newberry Springs, California. During the landing flare, the airplane collided with three motor vehicles. The airplane was destroyed, and the commercially certificated pilot, who was the sole airplane occupant, was fatally injured. One of the occupants in an automobile was seriously injured, and another occupant in the same vehicle received minor injuries. Visual meteorological conditions prevailed, and no flight plan was filed for the personal flight, which was performed under 14 CFR Part 91. The pilot owned and operated the airplane. The flight originated from the Eagle Airpark, an uncontrolled airport located about 2 miles north of Needles, California. The time of departure and the pilot's route of flight between Needles and the crash site were not determined. However, based upon the distance between these sites (92 nautical miles), the estimated time of departure was not later than about 1215.

The pilot's family reported to the National Transportation Safety Board investigator that on August 11 they departed from Torrance, California, and flew to the Laughlin/Bullhead International Airport, Bullhead City, Arizona. En route, the pilot had observed a problem with the airplane. After landing at Laughlin, the pilot looked beneath the engine cowl and observed that oil had leaked from the engine. The family members elected to return to Torrance via automobile. The pilot decided to have the airplane repaired before flying it back to Torrance.

The pilot telephoned an airplane repair facility at the Eagle Airpark and asked if they could repair a leaking crankshaft nose seal. During the morning of August 14, the pilot departed Laughlin and flew to the Eagle Airpark to have the engine repaired. Eagle is located about 16 nm south of Laughlin.

At Eagle, mechanics observed an oil residue over the windscreen and engine. One mechanic reported that the oil covered the windshield, and had run down in a wave like pattern. In places the oil was noted dripping off the engine. The pilot was advised to have his engine removed for repair. The pilot declined indicating that he did not have enough money. However, he purchased an engine nose seal. The pilot hired another (independent) mechanic at the field to perform the requested nose seal repair.

In summary, this mechanic reported to the Safety Board investigator that he performed the requested work. He removed the propeller, cleaned the oil and sludge from the crankshaft, cleaned the area around the crankshaft seal, removed the old seal, and cleaned the seat. He then installed the new seal, reinstalled the propeller with a new "O" ring, and reinstalled the spinner. He then proceeded to clean the oil from the engine and cowling with solvent.

According to this mechanic, during his maintenance the pilot recounted events of his flight to Bullhead. The pilot reportedly stated that while en route the engine started to leak oil, and he had to use his global positioning satellite receiver to find Bullhead because he could not see out the front windshield. He also stated that upon landing he had to zig zag the airplane while taxiing to see where he was going.

After the repairs were completed, the mechanic asked the pilot to perform a ground run-up in order to check for leaks. The pilot declined and stated that the airplane was hard to start when it was hot. The pilot filled the airplane's fuel tanks, paid for the services, and took off.

The pilot's first recorded communications occurred at 1247 when he contacted the Los Angeles Air Route Traffic Control Center (ARTCC). The pilot stated that he had a "little oil leak on my windshield." At the time, the pilot indicated his position was 8 miles east of Hector. (Hector is about 1 mile from the accident site.) The pilot also stated that he was at 5,500 feet and over interstate highway 40 (I-40).

Two minutes later the pilot advised the controller that he was having a "real problem." The controller provided heading information toward the Daggett Airport.

At 1250, the pilot advised the controller that "the engine is starting to make funny noises," and it is "just about ready to lock up." The controller continued talking with the pilot and provided information regarding possible landing sites in his vicinity.

At 1252:14, the pilot stated that "the windshield's all covered with oil so I'm having to look out the side (window)." The following minute the pilot stated "I've totally lost oil pressure."

The pilot's last two recorded transmissions occurred at 1254, during which time he advised the controller that he was at 3,600 feet and was attempting to "pick out a spot on the (I-40) freeway." The pilot also inquired about the elevation of terrain beneath him.

Another airplane, identified by registration number N7639N, was flying in the vicinity and was vectored to the accident airplane's location. Between 1255 and 1257, the pilot of N7639N advised the controller that the accident airplane had flipped over, and it had come to rest on the north side of the freeway.

PERSONNEL INFORMATION

The pilot held a commercial pilot certificate and certified flight and ground instructor certificates. The last entry listed in the pilot's personal flight record logbook was dated 1991. Based upon a combination of the pilot's flight logs and airplane utilization records, the pilot is estimated to have had approximately 2,000 total flight hours, of which about 580 hours were flown in his accident airplane.

The first record of the pilot having flown the accident airplane was noted in his flight logbook, dated 1984. Between 1984 and the accident date, family members reported that the pilot regularly flew his airplane.

The pilot reportedly worked as a self-employed machinist. He was proficient using a variety of trade tools.

AIRPLANE INFORMATION

The airplane was manufactured in 1959. Regarding its maintenance history, the airplane's logbooks indicate that on August 16, 1974, a Continental factory overhauled engine (serial number 900185-OH) was installed in the airframe, which was being maintained on an annual inspection basis. At the time, the airframe's total time was 2,389.2 hours, as indicated by the engine's recording tachometer. The engine had 000.0 hours since its last major overhaul.

Between 1974 and the accident date, the airplane remained in service except for periods when maintenance and repairs were performed. In pertinent part, the logbooks indicate the following maintenance and repairs were performed:

On June 23, 1976, the engine crankcase was removed and replaced, at 2,785.41 tachometer hours.

On July 14, 1977, the engine tachometer was removed and replaced. Upon removal, the old tachometer registered 3,000.53 hours. The new tachometer registered 0000.02 hours.

Between 1979 and 1980, all of the cylinders were removed and replaced. On December 15, 1985, a crankshaft seal was installed. The listed tachometer time was 1,172.0 hours.

On June 10, 1986, at a tachometer time of 1,219.1 hours, a "zero time" propeller along with various undercarriage parts were installed due to a landing gear collapse event. The maintenance was completed by June 8, 1987. A notation in the maintenance records indicates that during this period the engine was removed and disassembled. The crankcase was found cracked on its right side front main saddle area. The case was repaired.

Beginning in 1989, the logbook indicates that the pilot performed various types of maintenance on the engine and airframe.

The last maintenance entry in the logbook was dated May 1, 2000, and it indicated completion of an annual inspection. The logbook indicates that the inspection was accomplished at an engine tachometer time of 1,735.0 hours.

A squawk sheet associated with this inspection was found with the airplane's maintenance records. The sheet was hand written, and it was marked with the notation "N878R . . . Apr 2000 Annual . . . Tach: 1735.0." The sheet listed 28 items that needed attention.

On the sheet, item number 7 was listed as follows: "Foreward (sic) crankshaft seal seeping." Item number 19 was listed as follows: "Foreward (sic) crankcase thru bolt is seeping oil."

Thirteen of the 28 items on the sheet were lined out. Item number 7 was not lined out. Item number 19 was lined out.

A tabulation of days and hours worked appeared on the bottom of the sheet.

METEOROLOGICAL INFORMATION

Visual meteorological conditions prevailed in the vicinity of the accident site. At 1252, the Barstow-Daggett Airport, located 16 miles west of the accident site, reported its visibility was 35 miles, the surface wind was from 080 degrees at 7 knots, and the temperature was 104 degrees Fahrenheit.

WRECKAGE AND IMPACT INFORMATION

Based upon reports from the California Highway Patrol, the Federal Aviation Administration, witnesses and Safety Board authorized participants, the accident site was located about 34 degrees 47.4 minutes north latitude, by 116 degrees 28.9 minutes west longitude. The accident site elevation was about 1,800 feet mean sea level. The initial point of impact (IPI) occurred on the westbound lanes of I-40. Wreckage was found scattered in the shoulder area north of the IPI, and it was principally orientated along a 290-degree magnetic track. The wreckage was noted over a 360-foot-long path.

The hood of one of the impacted motor vehicles was noted dented and partially crushed. Multiple propeller blade-like laceration marks were noted in the area of the vehicle's hood.

The main wreckage was found upside down, with the landing gear retracted. The engine and portions of the wings were found separated from the fuselage. The propeller assembly was found separated from the engine, aft of the mounting flange. A residue of oil was observed on the bottom of the fuselage and empennage. The oil residue was noted as far forward on the

airplane as the face (rearward surface) of the propeller blades. The back plate of the propeller spinner had oil streaks radiating out from the crankshaft flange area. There was no evidence of fire.

The airplane was recovered from the accident site and examined. The throttle and propeller controls were in the full forward position. The mixture control was in the full aft position.

Oil was noted dripping from the engine cowling. In several areas the oil residue was oriented in a forward to rearward direction, approximately parallel with the airplane's longitudinal axis.

The propeller blades were observed with leading edge nicks and gouges. The blades were scratched in a chordwise direction. The tip of one blade was missing. Oil covered over 3/4 of the blade span.

The engine's recording tachometer was observed registering 1,756.30 hours.

MEDICAL AND PATHOLOGICAL INFORMATION

On August 16, 2000, an autopsy was performed by the San Bernardino County Coroner's Office.

Results of toxicology tests on the pilot performed by the Federal Aviation Administration (FAA) were negative for all screened drugs except Atenolol, which was detected in blood and urine specimens. Atenolol is a prescription medication commonly used to control high blood pressure and is routinely approved by the FAA for that use.

TESTS AND RESEARCH

Under the supervision of the Safety Board investigator, a teardown examination of the engine was performed at the manufacturing facilities of Teledyne Continental Motors (TCM), in Mobile, Alabama. In summary, the TCM product analysis manager reported that the engine had sustained impact damage. Upon removal of the cylinders and splitting the engine case, no evidence of internal component failure or malfunction was noted---with one exception. The crankshaft was observed broken from the propeller flange.

A TCM metallurgist examined the fractured crankshaft. The metallurgist reported that about 2.3 inches inside the shaft bore, two arc marks were noted. The examination indicated that the fracture had originated at the site of the arc marks, and it had progressed in fatigue until overload occurred followed by separation of the propeller assembly. The metallurgist further verbally reported that copper was found tightly bonded within the arc marks at the crack origin inside the crankshaft.

A weld area was observed on the exterior surface of the engine case. The weld area was about 1.5 inches long and was located above the upper, front, through bolt. It was located on the forward portion of the right half of the case.

The TCM product analysis manager indicated that a clamp could be used when performing arc welding to provide an electric ground. If the grounding clamp, which may have a copper tip, was placed inside the crankshaft when the arc was started current could arc between the clamp and the crankshaft bore, thus melting the metal and creating a stress riser in the crankshaft. During engine operation, the fracture could progress in fatigue around the outside diameter of the crankshaft bore. As the crack growth progressed, it would provide an avenue for oil leakage.

ADDITIONAL INFORMATION

On October 25, 2000, the Safety Board investigator interviewed the FAA certificated airframe and powerplant mechanic who had performed the last annual inspection on the accident pilot's airplane. In pertinent part, the mechanic stated that he recalled having performed routine maintenance on the engine. He recalled observing a small about of oil seepage around the engine's crankshaft seal, but the amount was minor. He stated that it was not a "grounding event," and it was "really nothing more than a discoloration around the crankshaft." The mechanic also asserted that there was no evidence of a weld on the exterior surface, forward portion, of the engine's case.

With the exception of the engine and propeller assembly, all of the recovered airplane wreckage was released to the pilot's assigned insurance adjuster on August 15, 2000. The engine and propeller were released following their examinations and returned to the storage facilities of Aircraft Recovery, Compton, California, about November 1, 2000.

Pilot Information

Certificate:	Flight Instructor; Commercial	**Age:**	56, Male
Airplane Rating(s):	Multi-engine Land; Single-engine Land	**Seat Occupied:**	Left
Other Aircraft Rating(s):	None	**Restraint Used:**	Seatbelt
Instrument Rating(s):	Airplane	**Second Pilot Present:**	No
Instructor Rating(s):	Airplane Multi-engine; Airplane Single-engine; Instrument Airplane	**Toxicology Performed:**	Yes
Medical Certification:	Class 2 Valid Medical--w/ waivers/lim.	**Last FAA Medical Exam:**	08/05/1999
Occupational Pilot:		**Last Flight Review or Equivalent:**	01/27/1999
Flight Time:	2000 hours (Total, all aircraft), 580 hours (Total, this make and model), 1800 hours (Pilot In Command, all aircraft), 1 hours (Last 24 hours, all aircraft)		

Aircraft and Owner/Operator Information

Aircraft Make:	Beech	**Registration:**	N878R
Model/Series:	K35 K35	**Aircraft Category:**	Airplane
Year of Manufacture:		**Amateur Built:**	No
Airworthiness Certificate:	Utility	**Serial Number:**	D-6059
Landing Gear Type:	Retractable - Tricycle	**Seats:**	4
Date/Type of Last Inspection:	05/01/2000, Annual	**Certified Max Gross Wt.:**	2950 lbs
Time Since Last Inspection:	21 Hours	**Engines:**	1 Reciprocating
Airframe Total Time:	4757 Hours at time of accident	**Engine Manufacturer:**	Continental
ELT:	Installed, activated, did not aid in locating accident	**Engine Model/Series:**	IO-470-C
Registered Owner:	KENNETH L. TULL	**Rated Power:**	250 hp
Operator:	KENNETH L. TULL	**Operating Certificate(s) Held:**	None

Meteorological Information and Flight Plan

Conditions at Accident Site:	Visual Conditions	**Condition of Light:**	Day
Observation Facility, Elevation:	DAG, 1927 ft msl	**Distance from Accident Site:**	16 Nautical Miles
Observation Time:	1252 PDT	**Direction from Accident Site:**	270°
Lowest Cloud Condition:	Scattered / 7000 ft agl	**Visibility**	35 Miles
Lowest Ceiling:	None	**Visibility (RVR):**	
Wind Speed/Gusts:	7 knots /	**Turbulence Type Forecast/Actual:**	/
Wind Direction:	80°	**Turbulence Severity Forecast/Actual:**	/
Altimeter Setting:	29 inches Hg	**Temperature/Dew Point:**	40°C / 7°C
Precipitation and Obscuration:			
Departure Point:	Needles, AZ (A09)	**Type of Flight Plan Filed:**	None
Destination:	TORRANCE, CA (TOA)	**Type of Clearance:**	None
Departure Time:	1215 PDT	**Type of Airspace:**	Class G

Wreckage and Impact Information

Crew Injuries:	1 Fatal	**Aircraft Damage:**	Destroyed
Passenger Injuries:	N/A	**Aircraft Fire:**	None
Ground Injuries:	1 Serious, 1 Minor	**Aircraft Explosion:**	None
Total Injuries:	1 Fatal, 1 Serious, 1 Minor	**Latitude, Longitude:**	34.792500, -116.485833

Administrative Information

Investigator In Charge (IIC):	WAYNE POLLACK	**Report Date:**	07/15/2002
Additional Participating Persons:	Gary Kappa; WP-FSDO; Riverside, CA Eddie Webber; Raytheon Aircraft Company; Wichita, KS R.S. Scott Boyle; Continental Motors; Arvada, CO		
Publish Date:			
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